Precise Electrical Stimulation of the Human Brain

Medical Motivation:
Stimulation of the human brain to modulate primary motor function (e.g. Parkinson's disease) and higher cognitive brain function.

Non-invasive Brain stimulation Invasive

Transcranial Direct Current Stimulation (tDCS)

Applications, e.g.
- Tinnitus
- Stroke rehabilitation
- Mood disorders

Project: Optimizing injected current patterns using regular electrode arrays

Preprocessing
Segmentation
Mesh Generation
Generate tDCS Forward solution

Comparison of EGI and patch electrodes

Potential distribution mapped on anatomical surfaces (V/m*m)

Deep Brain Stimulation (DBS) for Parkinson's Disease

Symptoms
- Brain stimulation
- Medication

Project: Simulation based programming of DBS device

Collect patient data
Volumetric atlas
Simulation
Put on data server

Patient-specific model for stimulating the subthalamic nucleus

Optimizing Stimulation Parameters using an iPad

Reduces DBS programming time from 4h to 4 min!